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**Implementing Community Health Workers to Improve the
Management of Chronic Non-Communicable Diseases in Children**

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Implementing Community Health Workers to Improve the Management of Chronic Non-Communicable Diseases in Children

Abstract

Background: Childhood obesity, asthma, and untreated mental health conditions are three examples of chronic non-communicable diseases (CNDs) that pose a host of negative consequences later in life. Minority children from low-income families, especially those with environmental disadvantages, face additional risk factors for the development of these diseases. Community health workers (CHWs) are in a unique position to help address these negative health externalities by being attuned with the linguistic, cultural, and socioemotional needs of members of their communities. Research has demonstrated success in CHW-led interventions curtailing the negative impacts associated with these diseases in low-income, minority communities.

Methods: A literature review was conducted to investigate the efficacy of CHW interventions in improving outcomes related to pediatric CNDs. Databases utilized to obtain peer-reviewed research included PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Results: Ultimately, N = 13 studies pertaining to pediatric CNDs met inclusion criteria and were analyzed and discussed. The literature demonstrates that CHW-led interventions result in meaningful improvements in health outcomes related to pediatric CNDs.

Conclusion: CHW-led interventions, specifically home assessments and visits, are vital tools that can improve the quality of life and reduce morbidity and mortality among low-income community members living with CNDs.

Keywords: community health workers, low-income, asthma, obesity, mental health, health outcomes

Implementing Community Health Workers to Improve the Management of Chronic Non-Communicable Diseases in Children

Background

Among the chronic illnesses faced by children in the United States, three conditions with broad ranging impacts include: obesity, asthma, and mental health conditions. These chronic conditions have a host of adverse short and long-term consequences, especially when not identified and properly treated. Past efforts to improve these conditions have focused on both community and home-based interventions.

According to the Centers for Disease Control and Prevention (CDC) (2022), for children and adolescents aged 2-19 years old in 2017-2020, the prevalence of obesity in the United States was 19.7% and impacted 14.7 million children and adolescents. Sociodemographic data reveals that obesity prevalence disproportionately impacts Hispanic children (26.2%), and Black children (24.8%), relative to their non-Hispanic White (16.6%) and non-Hispanic Asian (9.0%) counterparts (CDC, 2022). Ogden et al. (2018) found that among children and adolescents aged 2-19 years old, the prevalence of obesity decreased as the head of the household's educational level decreased. Further, obesity prevalence was highest in the low and middle-income groups studied, relative to the high-income groups (Ogden et al., 2018). Complications related to obesity include diabetes mellitus, asthma, hypertension, sleep apnea, and joint issues. Thus, prevention and early intervention to address childhood obesity is critical in aiding the prevention of these complications in adolescence and adulthood (Calcaterra et al., 2020).

Similarly, asthma is a serious chronic lung disease that often involves exacerbations, requiring urgent care visits and hospitalization. The CDC (2021) estimates that approximately 4.7 million children ages 0-18 years old suffer from asthma, with the greatest proportion of these

children living below the poverty threshold. Over time, asthma can cause permanent lung damage and can impact the ability of children to participate in physical activity. When inadequately managed, asthma can lead to increased morbidity and mortality among children. Due to structural racism and inequities in social determinants of health (SDoH), Latinx and Black Americans have both a greater asthma prevalence and morbidity related to asthma relative to their White counterparts (Grant et al., 2022).

Mental health and neurodevelopmental disorders in children have a host of deleterious consequences, especially when not identified and addressed early in life. Particularly, depression and anxiety have increased in children ages 6-17 years old (CDC, 2023). Attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), which are frequently comorbid, can impact learning, school performance, educational achievements, and predispose children to the development of anxiety and depression (Avni et al., 2018). Relative to children of higher socioeconomic status (SES), children of lower SES suffer from higher rates of parent-reported mental health issues and untreated mental health needs (Hodgkinson et al., 2017). Research demonstrates that Latinx children residing in rural and urban areas are less likely to receive mental health services than White children (Howell & McFeeters, 2008).

The CHW Role

The CHW role is centered on enhancing community member access to healthcare services. Four key dimensions of healthcare services are the focus of CHW interventions, including: insurance status, source of care, receipt of physical exam, and self-efficacy (Capitman et al., 2009). CHWs act as liaisons between community members and healthcare institutions through home visits, which promotes their knowledge and utilization of these dimensions. During these home visits, CHWs provide critical education on the importance of routine primary

care, medication and treatment adherence, and how to utilize insurance or other community resources to maximize health and wellness. Thus, home visits provide an invaluable opportunity for CHWs to help community members navigate the complexities of the healthcare system and ultimately improve their health maintenance and health status.

Search Methodology

To obtain the best available literature on pediatric CNDs, as well as the most efficacious community-based interventions to address them, a systematic search and analysis of the literature was conducted. This search was guided by the Population, Intervention, Comparison, Outcome, and Time (*PICOT*) question. Databases utilized included PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL). Initially, the keywords: *chronic disease*, *pediatric*, and *community health worker*, were utilized and yielded 63 results. However, these results included a broad range of chronic diseases, many of which were irrelevant to the diseases of interest to this project. Thus, three additional searches were conducted. The keywords: *asthma* and *obesity*, were combined with *pediatric* and *community health worker*. These searches yielded 69 results and 82 results, respectively. The search terms *mental health AND pediatric AND community health worker* yielded 116 results. Additional evidence was obtained through reviewing the references of various sources in order to gather the most current literature on this topic. Inclusion criteria for the evidence included: English language, articles published from 2008-2022, full-text articles, and articles that were peer-reviewed. The PICOT question that was utilized was: *Do low-income, minority children with or at risk for CNDs and related complications, residing in rural and urban areas, who work with CHWs (compared to those who do not work with CHWs), have improved health outcomes?*

Integrated Review of the Literature

A review of the literature was conducted to assess current research on the effectiveness of the CHW role in addressing the needs and improving healthcare outcomes of low-income, minority children and their families. Included literature focuses on CHW-led interventions to curtail adverse outcomes associated with pediatric asthma, obesity, and mental health disorders.

Asthma

As asthma is one of the leading chronic diseases in the San Joaquin Valley, thus a thorough understanding of the possibilities for CHW-led asthma management programs is essential. Jonas et al. (2022) conducted a randomized controlled trial of CHW-delivered home based asthma interventions, or the Wee Wheezers asthma education program. Participants included children (N = 151), ages two through nine years old, with persistent asthma. The intervention involved eight hours of content, including: asthma signs and symptoms, medication and medication administration, symptom prevention including trigger reduction, asthma action plans, and techniques for communicating asthma-related needs. CHWs underwent a six-week training course prior to implementing home visits and educational content to families. Asthma symptom days was the primary outcome measure (the mean number of days in the past 14 days, where children experienced daytime symptoms) and was self-reported by caregivers. Secondary outcomes included healthcare utilization, caregivers' asthma knowledge, and illness management behaviors. These variables were assessed through demonstrations during home visits, Horne's Questionnaire, the Asthma Knowledge Questionnaire, the Asthma Illness Representation Scale, and the Asthma Routines Questionnaire. Descriptive statistics were generated. Data were analyzed using a repeated measures approach, with equations accounting for within-subject correlation. The coefficient β_i (group-by-time interactions) and corresponding p values were used

to determine statistically significant changes. At the nine-month mark, the intervention group had a reduction of 2.15 more symptom days ($\beta_i = -0.43$, 95% CI: -0.86 to -0.01; $p = 0.044$) than the control. At 12 months, the intervention group had a reduction of 2.32 more symptom days ($\beta_i = -0.47$; 95% CI: -0.92 to -0.03; $p = 0.038$) than the control group. The average score on the asthma knowledge questionnaire in the intervention group improved by 1.81 points more than the control group ($\beta = 1.81$; 95% CI: 0.85 to 2.77; $p < 0.001$). Taken together, these results show significant reductions in asthma symptom days among children and knowledge acquisition regarding asthma management among their caregivers. Importantly, these results validate the efficacy of CHW-led interventions in improving asthma management and facilitating optimal health outcomes among the study participants.

Similarly, Gutierrez Kapheim et al. (2015) implemented a one-year asthma and healthy homes intervention across six public housing developments in Chicago's inner city. The population included low-income children ($N = 59$), aged 2-17, with 95% of study participants being African American. The CHWs involved in this study were also residents of the public housing developments. CHWs taught study participants about asthma pathophysiology, asthma symptomatology, proper medication usage, recognition, and mitigation of triggers. CHWs also communicated with PCPs to establish asthma action plans. The researchers used a pre-and post-test design and utilized the non-parametric Wilcoxon signed-rank test to determine statistically significant changes at the $P < 0.05$ level. From baseline to the 12-month follow up, daytime ($P < 0.001$) and nighttime ($P = 0.01$) asthma symptoms reduced significantly (by an average of 0.8 days in the past two weeks). Quality of life scores for caregivers improved from 5.4 at baseline to 6.1 at the 12-month follow up (an increase of 0.7 points, $P < 0.05$). Lastly, urgent health

resource utilization, specifically the number of children making two or more ED visits, decreased from 27% at baseline to 5% at the 12-month follow up ($P < 0.001$).

Campbell et al. (2015) used a randomized parallel group trial of home visits by CHWs for Medicaid enrolled children ($N = 154$) in King County. CHWs conducted baseline knowledge assessments, assessed home environments/asthma triggers, and evaluated self-management processes. CHWs gave participants supplies to optimize their homes to reduce environmental triggers, provided asthma education, and coached participants and their caregiver on proper use of devices. Data on intervention effects were analyzed using multivariable linear regression and logistic regression for continuous, binary, and outcome variables. The intervention group had significantly greater improvements in symptom-free days (2.1 days in two weeks, $P < .001$), relative to the control group. Urgent health care utilization also significantly reduced among the intervention group (1.3 fewer visits over 12 months than controls, $P = .001$). Economically, these results are estimated to yield \$633.88 in cost savings per participant in the control group and a return on investment (ROI) of 1.90 (190%). This ROI is based on a significant reduction in baseline costs (medications, ED visits, provider visits and hospitalizations).

Woods et al. (2016) implemented the Community Asthma Initiative (CAI), for low-income, predominantly Black and Latinx children living in Boston, Massachusetts. The researchers hired multicultural, bilingual (in Spanish) CHWs to provide home visits and comprehensive case management to children and their families ($N = 908$) from 2005-2012. Interventions involved individualized asthma education and care coordination, home environmental assessments, education on use of home green-cleaning methods, integrated pest management education, and encouragement of smoking cessation. Paired t-tests were used to assess changes in the total number of asthma-related ED and hospital encounters one year before

and one year after enrollment. The rates among the CAI group were analyzed relative to the comparison group. McNemar's test was used for dichotomous variables (hospitalizations, missed school days, or missed physical activity), while paired t-tests and general linear model repeated measures were used for continuous variables (number of asthma related events). Results showed that at the 12-month follow up, there was a 79% decrease in asthma-related hospitalizations, a 56% decrease in ED visits, a 42% reduction in missed school days, a 46% decrease in parent/guardian missed workdays, and a 29% decrease in days of limited physical activities ($p < .001$). This study is unique in demonstrating not only the positive immediate health impacts of the intervention but also measurable improvements in social and occupational functioning related to better health.

Turcotte et al. (2014) conducted a similar study in low-income urban households in the Boston area. CHWs conducted environmental assessments and interventions in households ($n = 116$) for children ($N = 170$) living with asthma. The interventions focused on household safety, targeted environmental improvements, and preventative education. The Children's Health Survey for Asthma (CHSA), an evidence-based tool, was utilized to provide information on asthma status based on the physical and emotional health of the child and family, the social activity of the child, and healthcare (hospitalizations, ED visits) utilization. The CHSA assesses the past four weeks. Statistical analyses were completed using SAS version 9.2 utilizing the CHSA user's guide. Pre- and post-intervention CHSA scores and healthcare utilization were compared using the change in paired participant pre- and post-scores. There were statistically significant improvements in all domains of the CHSA. Specifically, based on a 95% confidence interval, from baseline to follow up, children's health scores improved 23.3 points, physical activity levels improved 8.4 points, emotional health improved 20.5 points, family activity

improved 8.7 points, and family emotional health improved 9.9 points. Asthma medication use decreased from 85% of children at baseline to 59% at follow up ($P \leq .001$). The cost of the intervention was \$192 per child (\$32,640 for $N = 170$). It was compared to reductions in asthma-related ED visits, hospitalizations, and doctor visits, between the 4-weeks period before baseline and the four-week period before the one-year final assessment. The cost reduction was estimated to be \$71,162 for the four-week period, and the estimated net savings were \$38,522.

These studies demonstrate the potential of the CHW role in facilitating statistically significant improvements in asthma symptom reduction, emergency healthcare resource utilization, caregiver and child knowledge and comfortability in disease management, and improvements in quality of life for community members living with asthma.

Obesity

Utilizing a mixed-methods design, Cloutier et al. (2018) implemented a 12-month obesity prevention program study at low-income preschools in Connecticut. Education was delivered by bilingual and bicultural CHWs and involved focus groups and interactive educational modules. The content centered around the themes of milk, sweetened beverages, screen time, and physical activity. Data on height and weight were obtained for $n = 328$ children (69%) in 2013, and $n = 336$ children (70%) in 2014. Results demonstrated that 37.4% of children were overweight or obese in 2013, compared to 35.9% of children in 2014 ($p > 0.05$). Additionally, children beginning preschool in 2014 were more likely to be overweight than children who were in the center since 2013 (36.2% vs 23.2%, $p < 0.05$). Caregivers and school administrators provided positive feedback on educational content and the CHWs leading the focus groups. Specifically, those attending the focus groups commended the way the information had been broken into manageable pieces and presented visually. While the difference between the baseline and follow-

up percentages for obesity is not statistically significant, this study does point to the potential of brief, interactive interventions delivered by CHWs in community-based settings.

Crespo et al. (2012) conducted a randomized controlled community trial with 13 schools, to assess the impact of Promotoras (community health advisors), in promoting healthy eating and physical activity among Latinx children (N = 808 parent-child dyads) enrolled in kindergarten through second grade. Participants were randomized to four conditions: family only, community-only, combined, or measurement only. Researchers measured parent and child BMI and administered a survey assessing parent and child behaviors related to diet and lifestyle. Data were collected at baseline (M1), 1-year post intervention (M2), 1-year follow up (M3), and 2-year follow up (M4). BMI was calculated for age and gender and given Z-scores and percentiles. Specifically, in the family + community condition, BMI percentiles at M1 were 72.63% and 74.62% at M4, and similar results were seen for the family-only and community-only groups. This indicates no statistically significant improvements in BMI among children ($p > 0.05$). However, important secondary outcomes, including behavioral changes, were achieved. These were measured through Likert scales ranging from 1 (much less than others) to 5 (more than others), and mean scores were calculated. Specifically, children in the family-only group, tended to be more physically active (M1 = 2.98, M4 = 3.15), have less screen time (M1 = 2.05, M4 = 1.76), and consume more fruits and vegetables (M1 = 1.89, M4 = 2.31) compared to the control group. Other environmental improvements due to the study included: changes in school cafeteria staff's promotion of healthy options, restructuring of school play and physical activity time, active participation from a local grocery store, and commitment from local policymakers to remediate conditions of city parks.

Bender et al. (2013) implemented and evaluated a two-phase, nine-month intervention aimed at improving health behaviors in low-income Latinx mother-child dyads ($N = 33$) in Southern California. A bilingual, trained Promotora, delivered the educational content, which included culturally tailored education on sugar-sweetened beverages (SSBs), physical activity, healthy food choices, and wellness activities. Mothers reported 24-hour recall of children's SSB consumption and were queried about serving size (4-12 oz) and frequency of consumption (0-6 servings per day). Mothers were asked to walk 30 minutes per day, and pedometers were used to measure step-counts. Height and weight, beverage consumption levels, and step-counts were measured at baseline, post-intervention, and six months postintervention. The results indicated that post-intervention, children's consumption of soda declined by 82% and other SSBs also declined by 73% ($p < 0.0167$). Water consumption also improved significantly by 46% ($p < 0.0167$). While child BMI did not decrease, maternal BMI decreased significantly by 1.5 points ($p < 0.05$), likely due to increased step counts and healthy nutrition, encouraged by the Promotoras.

Similarly, Falbe et al. (2015) conducted a randomized controlled trial with parent-child dyads ($N = 55$), using a ten-week Active and Healthy Families (AHF) model. This care model consisted of biweekly, two-hour group sessions led by Promotoras. Registered dietitians (RDs) and primary care physicians also helped to deliver the sessions. The Promotoras, RDs, and physicians were all fluent in Spanish, besides one physician who knew basic Spanish. Sessions focused on healthy eating behaviors, recipes, and targeted less optimal foods commonly eaten in Latinx households. Topics also included portion sizes, interactive and accessible physical activities, and personalized goal-setting. Multivariate linear regression models adjusting for age, sex, and baseline values were utilized to compare pre-intervention and post intervention changes

between participants and controls. Children assigned to the AHF group, displayed significant improvements in BMI z-scores (-0.10, 95% CI -0.19, -0.02, $p = .02$) and triglycerides (-26.8 mg/dL; 95% CI -50.1, -3.6; $p = 0.03$), relative to controls (increase of .02 in BMI Z-score).

Taken together, the results of these studies suggest that CHW-led interventions foster lifestyle changes and behavior modifications that can combat obesity and factors associated with the development of obesity.

Mental Health

Evidence suggests that CHW-delivered mental healthcare interventions can increase access to mental health services among communities that might not ordinarily have it. However, most current, high-quality studies on CHW care delivery are targeted to address physical health needs. That being said, the selected studies provide a broad overview of current efforts to try to link low-income communities to much needed mental health services for a broad range of caregiver and pediatric conditions.

Barnett et al. (2017) conducted a systematic review to assess current research on CHWs' delivery of mental health interventions in low-income communities. Search criteria included randomized controlled trials, quasi-experimental trials, and pre- post non-experimental trials, with CHWs as providers, from 1990 to 2015. Ultimately, $N = 43$ articles, met the inclusion criteria. The researchers found that the most common mental health conditions targeted included depression, psychological trauma, anxiety, and substance use. The CHWs in the selected studies were most commonly Promotoras, with a minimum of a high-school level degree. Importantly, more than 66% of randomized controlled trials with CHW models of mental health delivery demonstrated positive outcomes for participants in underserved communities relative to controls.

Garcia et al. (2012) outlined the development of Project Wings, a collaborative partnership between a public school in Minnesota, a community-based clinic, and the University of Minnesota School of Nursing. The goal of their program is to address the unmet mental health needs among Latinx adolescents. Their community-based participatory model is founded on several principles including: community as the unit of identity, building upon strengths in the community, facilitating equitable and collaborative partnerships, and attending to multiple determinants of health and disease. This grant-funded program involved a one-day training pilot for CHWs and an educational workshop for more than 60 Latinx parents. Parents were taught about strategies to address Latinx mental health issues and school and community-based resources for addressing these needs. While this program pilot is preliminary in nature, it provides a foundation for a multi-faceted mental health promotion model led by CHWs.

Hovey et al. (2014) conducted a cognitive-behavioral support group for Latina migrant farmworkers ($N = 6$) with elevated levels of depression. This intervention involved a six-session intervention led by a clinical psychologist aided by a Promotora. Participants completed baseline, posttreatment, and six-month follow-up assessments that included the Migrant Farm Worker Stress inventory, the Beck Hopelessness Scale, and the Rosenberg Self-Esteem Inventory. The results showed that 83% of participants achieved clinically significant improvements in their symptoms. Particularly, participant stress ($Z = 2.2, p = .01$) and depressive symptom scores ($Z = 2.0, p = .02$) reduced significantly, which was maintained at follow up (stress: $Z = 1.6, p = 0.58$ and depressive symptoms: $Z = 2.0, p = .02$). Importantly, having the Promotora as a group leader enhanced levels of trust among the women and reduced stigma.

Magaña et al. (2015) implemented a randomized controlled trial to improve health behaviors of Latina mothers of youths and adults diagnosed with intellectual and developmental

disabilities (IDD). The participants were separated into the intervention group (IG) (n = 42) and control group (CG) (n = 48) Using a community-based research approach, the researchers conducted three-day trainings with Promotoras, who then conducted eight home visits with Latinx mothers. During the home visits, Promotoras taught a curriculum called Caring for Myself that emphasized health-related self-efficacy, stress reduction, and positive health behaviors. A randomized two-group pre- and post-test design was used to test the efficacy of the Caring for Myself intervention. Results showed significant improvements in the pre- and post-test scores for the IG ($P < 0.001$), as well as significant between-group differences between the IG and CG. Specifically, the IG achieved significantly higher post-test scores (89.40) relative to the CG (74.63) in health-related self-efficacy self-care (IG: 68.20, CG: 51.56), nutrition (IG: 75.20, CG: 63.39), and overall health behaviors (IG: 68.07, CG: 54.21) ($P < 0.001$).

Discussion and Limitations

The 13 selected articles were evaluated using the Johns Hopkins Appendix E Research Evidence Appraisal Tool and the Appendix F Non-Research Evidence Appraisal Tool (Dang & Dearholt, 2017). One study, Garcia et al. (2012) was found to be level V (non-research evidence), but good quality. While non-research evidence is typically not regarded as good-quality, Garcia et al. (2012) provided a solid outline of a community-based, home visitation pilot program to enhance access to mental health services among Latinx adolescents and caregivers. Six studies were categorized as level II (quasi-experimental) and were all found to be of good quality. Many of these had consistent results, adequate sample sizes, and reliable conclusions. However, the level II studies lacked a control group, and some did not fully flush out the limitations, future directions, or broader implications of the results. Six studies were level I (randomized controlled trials) and were found to either be high quality (A) or good quality (B).

The studies reiterate the value of CHWs in delivering highly needed health services to low-income Latinx and minority communities and ultimately improving patient outcomes.

While many of the large scale randomized controlled trials came from the studies conducted on asthma and obesity, there is a dearth of high quality studies on the CHW role in delivering mental health services. The reasons for this are multifactorial, but largely stem from underfunding and lack of resource allocation to mental health services. Often, the provision of mental health services requires a licensed clinician. However, as demonstrated in studies such as Hovey et al. (2014), the CHW or Promotora, can be an asset to the clinician. That is, CHWs enhance the credibility of the clinician and ultimately increase the efficacy of the intervention or treatment.

Implications for Practice

The evidence demonstrates that CHW-led interventions can yield significant improvements in health outcomes for CNDs among pediatric community members. Noting the opportunity for better health outcomes through expanded use of CHWs, it is important that CHWs are adequately prepared to conduct comprehensive home visits and educate families on these topics to optimize the impact of their interactions with the community. Continuing education on pediatric CNDs for CHWs has the potential to enhance competence in a range of health topics. Specifically, information on action plans, medications, and triggers to address asthma, material on physical activity and proper nutrition to address obesity and related complications, and community resources and referral sources for mental health conditions are key areas specific to this project. In order to reach high-risk pediatric community members, CHWs can foster connections with clinicians (primary care providers, dieticians, mental health professionals) in the area. This would increase the ease with which CHWs can make referrals,

and in some cases, facilitate information-sharing between clinicians, patients, and CHWs.

Ultimately, this could lead to a reduction in risk factors, increase treatment adherence, and enhance health outcomes.

Conclusion

The literature demonstrates the broad-ranging positive impacts of CHW-led home-based interventions on improving the quality of life and health outcomes of those in low-income communities. CHW home visits, specifically low-income, minority communities, where community members are suffering from CNDs at disproportionate rates are imperative. This is because these visits may reveal a range of environmental, social, and individual characteristics that contribute to poor patient outcomes and mortality. The individual connection and rapport that CHWs have with families can increase feelings of trust in medical treatments, leading to enhanced utilization of these services, and hence improved healthcare outcomes (Boyd et al., 2021).

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